DOI: https://doi.org/10.33479/sakti.v4i2.53

Jurnal Sains dan Aplikasi Keilmuan Teknik Industri (SAKTI)
Journal of Industrial Engineering: Application and Research

Volume 04 No. 02 - December 2024
Journal homepage: www.sakti.machung.ac.id
ISSN: 2829-8519 (print) – ISSN: 2829-8748 (online)

Towards the X-shaped Person, the Next (Industrial) Leader in the Era of Industry 4.0 and Society 5.0

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Received 30 Aug 2024 / Revised 15 Sept 2024 / Accepted 01 Dec 2024 / Published 31 December 2024

Abstract. This paper examines the impact on the development of industry and society known as industry 4.0 and society 5.0. Caused by technological and business pressures influenced by the rapid development of digital technology. Industry 4.0 and society 5.0 require the type of person who has digital literacy as well as leadership abilities to lead the industry in an uncertain market situation that can have an impact on disruption. Therefore, to ensure the sustainability of the industry, the type of person who is able to lead the industry through increasing business pressures and strategic environment is needed. This paper evaluates and assesses three shaped of person called I, T, and X on factors related to industrial sustainability, especially in the future due to industry 4.0. The assessment results show that X-shaped person has the highest score of 3.75 compared to I with a score of 1.31 and T with a score of 2.66. This result is specifically influenced by the leadership factor because it has the highest weighting factor of 0.34 for this assessment. This paper proposes an X-shaped person development method both through internal and external programs such as the Leadership Development Program (LDP) or government leadership program held by the National Resilience Institute of the Republic of Indonesia (Lemhannas RI). It is concluded that the X-shaped person is important to be developed for the sustainability and competitiveness of industry today and in the future.

Keywords: X-shaped person, T-shaped person, Industry 4.0, Future industrial leader

1. Introduction

The rapid development of digital technology currently has both positive and negative impacts, especially on industry. The positive impact of current digital technology developments is on increasing efficiency, effectiveness and industrial productivity (Rüßmann et al., 2015). Industries that have adopted advanced (digital) technological developments are known as the 4th industrial revolution or better known as Industry 4.0 (Rüßmann et al., 2015). The term Industry 4.0 was first introduced by the Federal Ministry of Education and Research, Germany at the Hannover Automation Exhibition (Hannover Messe) in 2011 under the name Industry 4.0. This term initially did not refer directly to the 4th industrial revolution, but rather referred to the strategy of developing new technology in the manufacturing industry to provide solutions to megatrends, such as: mass customization, digitalization, very short product life cycles (Rüßmann

Citation format: Baskoro, G. (2024). Towards the X-shaped Person, the Next (Industrial) Leader in the Era of Industry 4.0 and Society 5.0. *Jurnal Sains dan Aplikasi Keilmuan Teknik Industri (SAKTI)*, *4*(2), 105-112. https://doi.org/10.33479/sakti.v4i2.53

et al., 2015). After that, in 2012 and 2013 the German Government prepared an overview, strategy and scope of Industry 4.0. From here the concept emerged that Industry 4.0 is an evolution of the previous industrial revolution (Kagermann et al., 2013; McKinsey, 2016; Rüßmann et al., 2015; Veile et al., 2019).

The fourth industrial revolution or so-called Industry 4.0 has begun, driven by internet technology applied in production systems or often called Cyber Physical Systems (CPS) or Industrial Internet of Things (IIoT). The information technology used includes and is not limited to big data, programming, networking, human machine interfaces. According to the Boston Consulting Group (BCG) (Rüßmann et al., 2015), information technology that supports Industry 4.0 is known as 9 pillars of advanced technology 1). Big data and analytics, 2). Autonomous robot, 3). Simulation, 4). Horizontal and vertical system integration, 5). Industrial Internet of Things, 6). Cybersecurity, 7). Clouds, 8). Additive manufacturing, and 9). Augmented reality. From the nine pillars of advanced technology that form the basis of Industry 4.0, some of them are actually already used in manufacturing, but Industry 4.0 will change production systems so that isolated cells can be optimized and combined into fully integrated and automated production flow and optimization that generates greater efficiencies and transforms traditional production relationships between suppliers, manufacturers, customers, and between people and machines.

With the advent of Industry 4.0, it is expected to optimize and enhance industrial competitiveness by making production operations more effective, efficient, and economical, ultimately benefiting companies. This industrial revolution brings numerous advantages, including the potential to empower individuals and communities by creating new opportunities for social, economic, and personal development. It minimizes the risk of human error, as computer systems exercise full control, ensuring consistent work results. Furthermore, it increases productivity efficiency in production processes, allowing goods to be produced in greater volumes while utilizing fewer resources. Industry 4.0 also ensures data security through cloud computing, facilitates real-time control of sophisticated systems, enhances visibility into the status of goods availability and delivery processes, and reduces supply chain handling costs. These advancements collectively contribute to a more streamlined and competitive industrial landscape.Based on analysis by the Boston Consulting Group (BCG) (Rüßmann et al., 2015), in the manufacturing industry in Germany, there are four areas that benefit from the industrial revolution 4.0: 1) Productivity, 2). Income growth, 3) Employment, and 4) Capital investment. However, Industry 4.0 still has the following challenges 1) Security, 2) Employment, 3) Digital technology literacy, and 4). Competency Transformation.

Therefore, human resource qualifications must be in line with the characteristics of Industry 4.0, especially but not limited to type of industry, management and organization, culture, products and services, technology and factory operations. For this reason, efforts are needed to narrow the gap by improving the qualifications of existing human resources. Traditional human resources are generally classified as I-shaped person, namely specialists in one area of knowledge/skills (Buxton, 2009). Therefore, I-shaped person are no longer relevant to current situations and conditions. Currently, what is needed is a T-shaped person, namely a person who has a balance between technical and managerial abilities (Gibson, 2021; Hammer et al., 2021; Saviano et al., 2016). In fact, due to existing technological developments, more than just one technical ability is needed, more technical abilities are needed with good managerial skills, which is known as Pi, Comb-shaped person (Bassano, 2018; Dekoninck & Bridge, 2023; Veenendaal, 2020).

With the rise of Industry 4.0 and changes in current business pressures that emphasize the use of advanced technology in industry, therefore Industry 4.0 will be a game changer with the consequence that those who cannot adapt will be disrupted (Rüßmann et al., 2015). For this reason, this article will describe the X-shaped person who is able to maintain the sustainability of industrial competitiveness in the future.

2. Methods

This article describes human resources that can maintain the sustainability of industrial competitiveness in the future using exploratory study methods and case studies. The exploratory study method was used because this study is still preliminary in nature with a fairly broad scope with the aim of exploring ideas and understanding in order to gain initial insight (Sitepu, 2020). This method uses qualitative case studies with observations in several best-in-class industries in Indonesia. According to (Sitepu, 2020), this exploratory study method is considered to be most appropriate related to the objective of this study because the objective is to find something as it really is, as a first step in describing X-shaped person more clearly and completely.

For this reason, this studi assesses that X-shaped person are the right type to lead industries in the Industry 4.0 era. An X-shaped person is actually a T-shaped person who has good leadership abilities (Rahman, 2024). This assessment was carried out by comparing the strengths and weaknesses, especially of I, T and X-shaped person in relation to the challenge factors faced as a result of Industry 4.0. The shape and characteristics of type I, T, and X-shaped person are as in Figure 1. The main characteristics are determined by the depth of technical abilities and the breadth of managerial and leadership abilities.

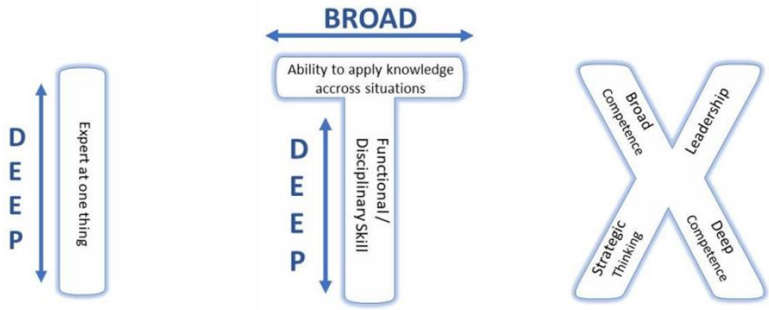

Figure 1. Characteristic of I-shaped, T-shaped, and X-shaped Person (Veenendaal, 2020).

(Rahman, 2024) provides the characteristics of I, T and X-shaped person with consideration factor of expertise, collaboration, innovation, and flexibility as summarized in Table 1.

Table 1. Characteristics of I-shape, T-shaped, and X-shaped person (Rahman, 2024)

Factor	I-Shaped	T-Shaped	X-Shaped
Expertise	Deep in one area, limited elsewhere	Deep in one area, broad in others	Deep in one area, broad in others, plus leadership quality
Collaboration	Low, primarily works within specialty	High, across various disciplines	Very high, excel in leading teams
Innovation	Low, focused on specific domain	High, thanks to interdisciplinary approach	Highest, drives innovation through leadership and collaboration
Flexibility	Low, prefer specialized tasks	High, adaptable to different roles	High, adaptable to leadership and collaborative roles

Therefore, this study intends to understand the strengths and weaknesses of I, T, and X-shaped person through an assessment of factors, other sources may specify different factors, that are considered important for industrial sustainability and competitiveness, namely 1. Digital literacy, 2. Business literacy, 3. Innovation, 4. Culture of Change, and 6. Leadership. These factors are considered important in relation to the industries' ability to face business turmoil.

2.1 Digital Literacy (DL)

Industry 4.0 is an indicator that future industries will be industries that adopt advanced technology, especially IT and digital-based technology. This technology has an impact on society

which is known as society 5.0. (Deguchi et al., 2020; Fukuyama, 2018; *Soc. 5.0*, 2020). Therefore, digital literacy (DL) is very important in the era of Industry 4.0 and Society 5.0 (Deguchi et al., 2020; Fukuyama, 2018; Kagermann et al., 2013; McKinsey, 2016; Rüßmann et al., 2015; Veile et al., 2019). Digital literacy is not only limited to the use of digital technology but also an understanding of the impact of digital technology at large (Martin, 2006). The definition of digital literacy according to (Martin, 2006) is awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action. Meanwhile, according to UNESCO digital literacy involves the confident and critical use of a full range of digital technologies for information, communication and basic problem-solving in all aspects of life. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet. According to Unesco, digital literacy is a very important ability for the future (Law et al., 2018; Unesco, 2006).

2.2 Business Literacy (BL)

The current world situation known as VUCA stands for volatility, uncertainty, complexity, and ambiguity. Currently the new world known as BANI stands for brittle, anxious, non-linear, and incomprehensible. Both VUCA and BANI have an impact on business situations which have become very uncertain with one of the most worrying things being disruption (Baskoro, 2023; de Godoy & Filho, 2021; Evseeva et al., 2022; Murgatrotd, 2024). Therefore, to ensure the sustainability of the industry, business literacy is very important for the industry of the future. According to (Elfandi et al., 2021) in (Rahayu et al., 2023) business literacy is an understanding and ability in the business area. It is the knowledge gained in various ways that encourages people to have an entrepreneurial interest. While (Yaghoubi Farani et al., 2017) defined business literacy as business process knowledge to be used in the decision-making process of business.

2.2.1 Innovation Capability

Innovation is something that will continue to happen and cannot be stopped. Innovation is one way to maintain the sustainability of a company, because if a company does not innovate then the company will be exposed to disruption caused by innovation from competitorsherefore, innovation capability is very important to ensure sustainability and competitiveness. According to (Saunila & Ukko, 2012) in (Narcizo et al., 2017) innovation capability is simply organization's potential to innovate. Actually, there are many definitions of innovation capabilities by several authors (Narcizo et al., 2017). According to (Narcizo et al., 2017) innovation capabilities includes the following aspects: 1. Assets/Organizational Property, 2. Organizational process, and 3. Potential.

2.2.2 Culture Change

Change is the only thing that is certain to happen. Therefore, the ability to accept and encourage change is needed. In Industry, a culture of change is very important so that Industry has resilience and is able to maintain its sustainability and competitiveness. The need of change culture is to help company for transformation journey. Company adaptive culture is actually for the foundation of company transformation such as business transformation, digital transformation etc. (Hollister et al., 2021). Culture according to Hollister et al. 2021 is a shared set of values, beliefs, and norms of behavior.

2.2.3 Leadership

Leadership is needed in industry especially in VUCA and BANI world today and in the future because the leadership function is very important for competitiveness and sustainability (Fletcher et al., 2023; Murgatrotd, 2024; Rath et al., 2021; Schaffer, 2021). This paper consider important leadership functions, among others, include 1. Setting a vision, 2. Creating a strategy, 3.

Managing resources, 4. Driving change, 5. Role model, 6. Etc. One of the important factors of leadership is responsibility, namely towards oneself and others. Therefore, to be able to ensure the sustainability of the industry in the face of existing business and technological pressures, leadership ability and will to responsible is necessary.

3. Results and Discussion

Determining the weight of five factors that are considered important for the current and future industry used to assess people of type I, T, and X is carried out using pairwise comparisons. This method is generally used in assessments using Analytical Hierarchy Process (AHP) (Baskoro et al., 2024). However, determining the weight can also be done through other methods such as using Focus Group Discussion (FGD) by experts. The scale used in determining pairwise comparisons refers to Table 2 (R. W. Saaty, 1987; T. L. Saaty, 1988).

Table 2. Pairwise comparison scale (R. W. Saaty, 1987; T. L. Saaty, 1988)

Importance	Definition	Remark
1	Equal importance	Both elements have similar effect.
3	Weak importance of one over	Experience and judgment strongly favor one element compared to its pair.
5	Essential or strong importance	One element is more important than the other.
7	Demonstrated importance	One element is clearly more important than the other elements.
9	Extreme importance	One element is more important than the other elements
2,4,6,8	Intermediate values between the two adjacent judgments	When compromise is needed. Values between two adjacent judgment values.
Reciprocal	Opposite	Reciprocals for inverse comparison.

The calculation results for determining the weight are as stated in Table 3.

Table 3. Determining priority using pairwise comparisons

Factor	Digital Lit.	Business Lit.	Innovation	Change Culture	Leadership	Priority/ Weight	%
Digital Lit.	1.00	0.33	2.00	1.00	0.33	0.14	13.62
Business Lit.	3.00	1.00	2.00	1.00	1.00	0.26	26.24
Innovation Capability	0.50	0.50	1.00	1.00	0.33	0.11	11.09
Change Culture	1.00	1.00	1.00	1.00	0.33	0.15	14.87
Leadership	3.00	1.00	3.00	3.00	1.00	0.34	34.18
TOTAL	**8.50**	**3.83**	**9.00**	**7.00**	**3.00**	**1.00**	**100**

From the results in Table 3. it can be seen that leadership has the largest priority, namely 34.18% with a weight of 0.34, second place is business literacy 26.24% with a weight of 0.26, and third place is a culture of change 14.87% with a weight of 0.15. This weight indicates the level of importance of factors that influence the sustainability of the industry in the present and future.

The assessment for I, T, and X-shaped person was carried out subjectively by the author based on the author's experience and careful observations over a period of 5 years in national industries that are classified as best-in-class. The result are as shown in table 4.

Table 4. The results of the assessment of I, T, X-shaped person

Factor	Weight Factor (WF)	I-shaped	WF.I	T-shaped	WF.T	X-shaped	WF.X
Digital Lit.	0.14	2	0.28	3	0.42	3	0.42
Business Lit.	0.26	1	0.26	3	0.78	4	1.04
Innovation Cap.	0.11	2.5	0.28	3	0.33	3	0.33
Change culture	0.15	1	0.15	3	0.45	4	0.60
Leadership	0.34	1	0.34	2	0.68	4	1.36
Total	1		1.31		2.66		**3.75**

Note:
- The assessment was carried out subjectively by the author
- Score is 1 to 5

The results of this subjective assessment show that X-shaped person has the highest score, namely 3.75 compared to other type of person. This score is highest compared to T-shaped person with a score of 2.66 and I-shaped person with a score of 1.31. The significant difference in results shows that X-shaped person has a significant influence on factors that impact the sustainability and competitiveness of industry. However, the T-shaped person is actually still relevant to current and future needs as long as the T-shaped person is not in the top leadership position.

The biggest factor that influences the results of this assessment is the leadership abilities of X-shaped person. Therefore, developing human resources to be the X-shaped person can be carried out through a structured, massive and systematic leadership development program (SMT). This effort can be carried out in various ways and methods, including leadership development programs (LDP which are carried out within the organization or carried out outside the organization. Leadership development can also be carried out by joining to leadership development programs carried out by the government such as those carried out by National Resilience Institute of Republic of Indonesia (Lemhannas RI) for short, medium and long term program. The main advantage of the leadership program carried out by Lemhannas RI is the development of national insight and the spirit of nationalism.

As the assessment in Table 4. was carried out subjectively by the author, consequently the results of assessments may be different if it is carried out by different people. Similarly, the weight factors have also been defined subjectively by the author. Therefore, to minimize subjectivity it is recommended to 1) determine the weight factors by several experts in the organization and 2) to carry out the assessment by different experts from different organizations.

4. Conclusions

Based on the results and discussion, it can be concluded that X-shaped person is considered very relevant to be able to lead the industry to attain and maintain sustainability and competitiveness in the future as business pressures and the strategic environment develop. X-shaped person can be developed from T-shaped person by equipping with standard/excellent knowledge and leadership skills. The leadership development can be done internally and/or externally through LDP and or Lemhannas RI program.

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